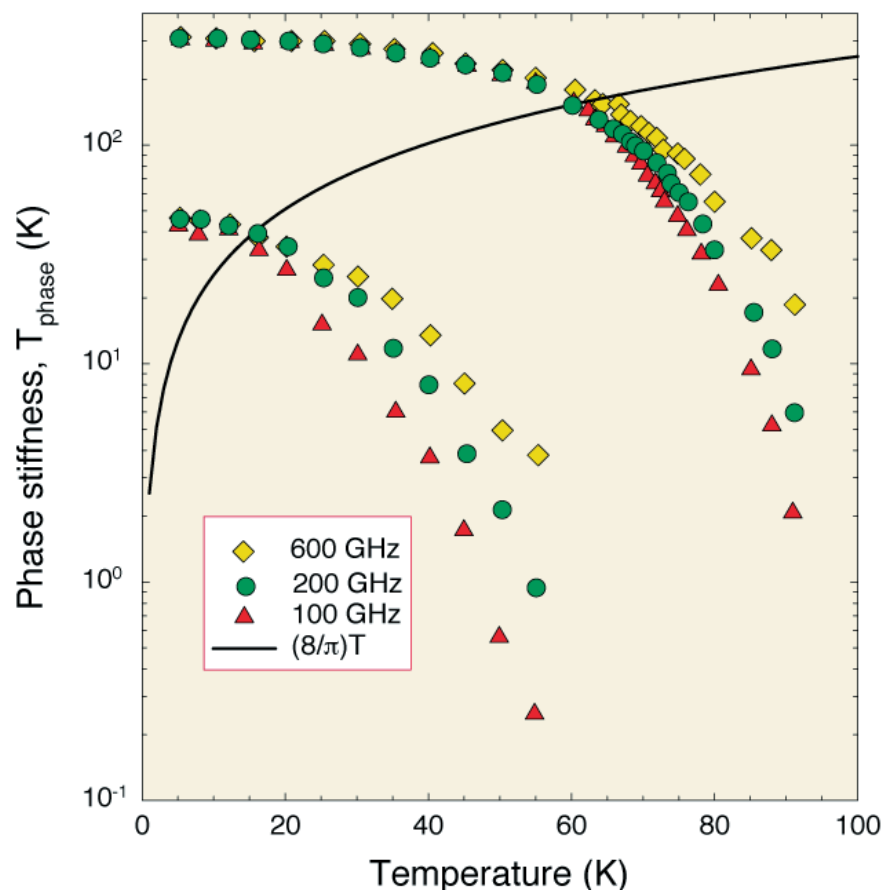


# Breakthrough in the Understanding of High- $T_c$ Superconductors

## *Cooper Pairs Observed Above $T_c$*



Frequency-dependent measurements of the phase stiffness energy (converted to the equivalent temperature  $T_{\text{phase}}$ ) of two  $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{2+\delta}$  samples with different O contents, one with  $T_c = 33$  (left) and one with  $T_c = 74$  K (right). The observation of a non-zero, frequency dependent  $T_{\text{phase}}$  above  $T_c$  is direct evidence for the persistence of Cooper pairing in the normal (non-superconducting) state. Moreover, frequency dependence is observed (i.e. the curves diverge) at exactly that temperature (black line) predicted by Kosterlitz and Thouless to describe loss of phase coherence in two spatial dimensions. This shows that the breakup of phase coherence is mediated by the thermal generation of vortices.